

No. 11. — *New Lichadacea in the Collections of the Museum of Comparative Zoölogy*

BY FRED B. PHLEGER, JR.

This paper is based upon specimens of lichadian trilobites in the collections of the Museum of Comparative Zoölogy. In the course of a comprehensive study of the genera of this group, the writer had previously observed a few new species in this collection. These are here described, and some old species are redescribed in the light of specimens at hand. Illustrations of plesiotype specimens are included only when they add to, or correct, those already published.

The writer is grateful to Professor P. E. Raymond for his criticism.

Phylum	ARTHROPODA
Class	CRUSTACEA
Subclass	TRILOBITA
Order	OPISTHOPARIA Beecher
Superfamily	LICHADACEA Phleger
Family	LICHADIDAE Hawle and Corda
Subfamily	LICHADINAE Gürich
Genus	ARCTINURUS Castelnau

ARCTINURUS BOLTONI (Biggsby)

Plate 2, fig. 1

Paradoxides boltoni, Biggsby, Journ. Acad. Nat. Sci. Philadelphia, 1st. ser., 4, pt. 2, 1825, p. 365, pl. 23.

Arctinurus boltoni, Castelnau, Essai Syst. Silur. l'Amer., 1843., p. 21, pl. 3.

Lichas boltoni, Hall, Pal. New York, 2, 1852, p. 311, pl. 69; pl. 70, figs. la-g, j-l.

Lichas (Oncholichas) boltoni, Schmidt, Mem. l'Acad. Imp. Sci. St. Petersburg, 7th. ser., 33, 1885, p. 31.

Pterolichas boltoni, Gürich, Neues Jarb. f. Min., Geol., u Pal., Beilag, 14, 1901, p. 528, pl. 20, fig. 2.

For complete synonymy see Bassler, U. S. Nat. Mus. Bull. 92.

Inasmuch as there is no concise and completely accurate description of this species available, it seems advisable to re-describe it in the light of the most recent interpretations of the morphology of the Lichadacea. The following description is based upon a complete

specimen which has been generously loaned by Dr. Rudolph Ruedemann from the New York State Museum. Photographs of it are in the Museum of Comparative Zoölogy, where there are also several incomplete specimens, mostly pygidia.

Cephalon large, much wider than long, with wide free cheeks. There is a raised area, the borders of which correspond in position to the axial furrows on the thorax, and on which are the glabella and a part of the fixed cheeks. The eyes are large, elongate, close to the glabella; they extend from a little in front of the occipital furrow to a position parallel to the second lateral glabellar furrows. The facial sutures cut the posterior margin of the cephalon about halfway between the genal angle and the axial furrows on the occipital lobe, traverse the cephalon at a low angle to the posterior tips of the eyes; anterior to the eyes their course cannot be determined. The fixed cheeks are small and narrow. The glabella is comparatively long and narrow, produced in a tongue-like projection. The median glabellar lobe is narrow in the middle part of its extent but flares anteriorly; it also flares slightly posteriorly. The longitudinal glabellar furrows are complete and extend to the occipital furrow; they are weakly incised from the position of the third lateral furrows to the occipital furrow. The anterior lateral furrows are complete; the second and third are indicated by notches on the longitudinal furrows; the fourth laterals apparently are not represented.

The thorax is wider than long, composed of eleven segments. The pleural lobes are slightly wider than the median, each pleuron produced into a free point. Each is traversed by a diagonal furrow.

The pygidium is composed of three pairs of wide lateral segments, each ending in a free point and traversed by a diagonal furrow. The axial lobe has two furrows; it rapidly narrows, only the anterior one-third is elevated; from there it flares posteriorly.

The surface of the specimen is covered with coarse pustules with the exception of a fairly wide and continuous border on which there are none, but which is ornamented with parallel and more or less continuous furrows.

Formation and locality: Lockport shale, Rochester, New York.

ARCTINURUS PUGNAX (Winchell and Marcy)

Lichas pugnax Winchell and Marcy, Mem. Boston Soc. Nat. Hist., 1866, 1, pt. 1, p. 103, pl. 3, fig. 10.; Hall, 20th. Rept. New York State Cab. Nat. Hist., 1867, p. 393 (revised edition, p. 424, pl. 25, fig. 20.).

There is an excellent specimen of a glabella belonging to this species in the collection. Unfortunately, the palpebral lobes are not preserved, so that it is not possible to ascertain the size and position of the eyes. The frontal brim, which is broken, may or may not have had the tongue-shaped projection which is characteristic of *Arctinurus*. In other respects, however, the specimen at hand agrees closely with that genus.

A. pugnax differs from *A. boltoni* (Biggsby)¹ in having the glabellar lobes more inflated and set off from each other, and in having the anterior part of the median lobe produced dorsally in a mound-shaped projection.

Formation and locality: Racine (Silurian), Cicero, Illinois.

Day collection. From W. C. Egan.

The plesiotype is Mus. Comp. Zoöl. no. 1552.

Subfamily HOMOLICHADINAE Phleger

Genus TRIMEROLICHAS Phleger

TRIMEROLICHAS MARGINATUS (Lindström)

Lichas marginatus Lindström, Ofversigt af. Kongl. Vet.-Akad. Forhandlingar, 1885, p. 58, pl. 14, figs. 8, 9.

There is a specimen of this species in the collection which shows some interesting new features. The wide brim around the anterior part of the cephalon is well-developed and strongly turned upward. The comparatively small eye is located between the position of the second and third lateral furrows, close to the glabella. The median glabellar lobe is very narrow for a part of its extension between the lateral lobes, and flares only slightly posteriorly. The positions of the second lateral furrows are clearly indicated by notches on the longitudinal furrows. The basal lobes are small, elongate, and tapered at the ends; they are distinctly offset outside the posterior ends of the lateral lobes.

Formation and locality: Dudley formation, Dudley, England.

The plesiotype is Mus. Comp. Zoöl. no. 1553.

TRIMEROLOCHAS BREVICEPS (Hall)

Lichas breviceps Hall, Trans. Albany Inst., 1863, 4, p. 233; 28th. Rept. New York State Mus. Nat. Hist., 1879, p. 197, pl. 34, figs. 1-7.

¹See illustration in this paper, pl. 2, fig. 1.

There are three specimens of this species in the collection. Since Hall's description was not quite complete, a few additions to it are here appended.

The glabellae are only moderately convex. There is a distinct brim on the anterior part of the cephalon. The third glabellar furrows, although not present on the lateral lobes, are represented on the median glabellar lobe. The basal lobes are very small and elongate, and are offset outside the tricomposite lobes.

Formation and locality: Waldron shale, Indiana.

The plesiotypes are Mus. Comp. Zool. no. 4472.

TRIMEROLICHAS TRENTONENSIS (Hall)

Platynotus trentonensis Hall, Pal. New York, 1, 1847, p. 235, pl. 64, figs. la-d.

Platymetopus trentonensis, Weller, 1903, Geol. Surv. New Jersey, Pal., 3, p. 200, pl. 15, figs. 17-19.

This species was placed in *Platynotus* by Hall and *Platymetopus* by Weller. Both these names are now partially the equivalent of *Tetralichas*. Hall's species does not have the quadricomposite lobes which are characteristic of *Tetralichas*, and clearly belongs to *Trimerolichas*.

Trimerolichas trentonensis (Hall) should not be confused with *Tetralichas trentonensis* (Conrad).

The plesiotype is Mus. Comp. Zool. no. 4471.

TRIMEROLICHAS OBLIVUS (Hall)

Lichas obivus Hall, 20th. Rept. New York State Cab. Nat. Hist., rev. ed., 1870, p. 424, pl. 25, fig. 19.

Hall's description of this species is incomplete. The illustration clearly shows comparatively large basal lobes, and the longitudinal furrows abruptly diverge from the median lobe at the position of the third lateral glabellar furrows. This species undoubtedly belongs in *Trimerolichas*.

TRIMEROLICHAS WARBURGAE spec. nov.

Plate 1, fig. 7

The glabella is as wide as long, moderately inflated. The tricomposite lateral lobes are broadly rounded anteriorly and pointed

posteriorly. The inside margin of the basal lobes begin just mesially from the posterior pointed termination of the tricomposite lobes and are extended outward therefrom; they are egg-shaped, with the pointed end inward. The middle glabellar lobe flares forward from the position of the third lateral furrows. The third lateral furrows are indicated by abrupt outward deflections of the posterior parts of the longitudinal furrows.

Measurements

Length of glabella	11 mm.
Width of glabella	11 mm.
Width of lateral lobes	3.5 mm.
Width of median lobe in most narrow part	4 mm.

This species differs from *Trimerolichas trentonensis* (Hall)¹, to which it is most closely allied, in having larger basal lobes and in having the posterior course of the longitudinal furrows abruptly deflected outward. Moreover, in *T. trentonensis* the longitudinal furrows are almost parallel in the middle part of their course, whereas, they are converging in *T. warburgae*.

Formation and locality: Cincinnati, Cincinnati, Ohio.

The holotype is Mus. Comp. Zoöl. no. 4473.

TRIMEROLICHAS INEXPECTANS spec. nov.

Plate 1, fig. 4

The glabella is inflated, almost as long as wide. The lateral glabellar lobes are completely circumscribed; the second lateral furrows are indicated by notches on the longitudinal furrows. The basal glabellar lobes are very small, elongate, and offset outside the posterior terminations of the lateral lobes. The occipital segment is very wide.

Length of glabella	17 mm.
Width of glabella	16 mm.
Width of lateral lobe	5 mm.
Width of median lobe at most narrow part	3 mm.

This species is closely related to *Trimerolichas obvius* (Hall), but differs from it in having smaller basal glabellar lobes, in having the second lateral glabellar furrows indicated by notches on the longitudinal furrows, and in having the posterior extension of the longi-

¹ Hall, Pal. New York, 1, 1847, p. 235, pl. 64, figs. la-d.

nal furrows more broadly rounded in outline, and apparently in having a wider occipital segment. *T. inexpectans* differs from *T. warburgae* in having smaller basal glabellar lobes, and in having the median glabellar lobe more constricted between the lateral ones.

In neither *T. inexpectans* nor *T. obvius* is the wide anterior brim characteristic of the genus *Trimerolichas* preserved. It is presumed that the brim has been destroyed, since the specimens are incompletely preserved. If this feature does not actually exist, however, the two species probably belong to a new genus.

Formation and locality: Wauwatosia (Silurian), Wauwatosia, Wisconsin.

The holotype is Mus. Comp. Zoöl. no. 1551.

Family TROCHURIDAE Phleger

Subfamily TROCHURINAE Phleger

Genus TROCHURUS Beyrich

TROCHURUS BULBOSUS spec. nov.

Plate 1, figs. 5, 6

The cranidium is small, strongly convex, with the anterior glabellar lobe overhanging the frontal margin. There is a row of small spines projecting from the frontal border. The surface is covered with small and uniform pustules.

Length 6mm., width 7.5mm.

Trochurus bulbosus differs from *T. phlyctainoides* (Green), (as figured by Hall and Weller)¹, to which it is closely allied, in having glabellar furrows which are more deeply incised, and in having a constriction of the median lobe between the third lateral lobes. It differs from all other species of *Trochurus* in having spines projecting from the frontal border.

Formation and locality: Clinton drift at Trenton Falls, New York.

Collected by C. D. Walcott.

The holotype is Mus. Comp. Zoöl. no. 1555.

¹ Hall, Pal. New York, 2, 1852, p. 314, pl. 70, figs. 2a-c; Weller, Bull. Chicago Acad. Sci., Nat. Hist. Surv., 4, pt. 2, 1907, p. 234, pl. 22, figs. 1-4.

GENUS RAYMONDARGES gen. nov.

Trochurinae with longitudinal furrows incomplete or faintly incised posterior to the third lateral furrows; third lateral furrows incomplete or faintly incised; fourth lateral furrows absent. *Raymondarges* differs in these respects from *Trochurus*.

This genus represents a specialized end stage of one branch of the Trochurinae. Although the glabellar lobation is weakly developed, there are indications of the former presence of the typical trochurid lobation. *Raymondarges* undoubtedly descended from *Trochurus* in Lower or Middle Silurian times.

Genotype: *Raymondarges reporyjensis* Phleger.

RAYMONDARGES REPORYJENSIS spec. nov.

Plate 1, figs. 8, 9

The glabella is inflated and has a narrow anterior brim. There are fairly deep pits at the junction of the longitudinal and third lateral furrows; a slight depression extends across the median lobe at the position of the third lateral furrows. The median lobe at its most narrow part is about 50% wider than either lateral lobe. The lateral lobes are defined on the outside by well-incised and complete axial furrows. In some specimens there is a faint depression marking the extension of the longitudinal furrows to the occipital furrow. In one the fourth lateral furrows are very faintly indicated mesally; this clearly shows that the basal lobes have united with the third lateral lobes and are fundamentally a part of the lateral glabellar lobation.

Measurements

Length of glabella	9.5 mm.
Width of glabella	7 mm.
Width of lateral lobe	2 mm.
Width of median lobe in most narrow part	3 mm.

Formation and locality: Etage E-e2, Reporyje, Bohemia.

The holotype is Mus. Comp. Zool. no. 4476.

Subfamily EUARGINAE Gürich

Genus EUERGES Gürich

EUARGES BRANIKENSIS (Barrande)

Plate 1, fig. 3

Lichas branikensis Barrande, Syst. Silur. de la Bohême, 1, suppl., 1872, p. 43, pl. 16, figs. 31-33.

Barrande apparently knew only the hypostoma and pygidium of this species. In this collection there are several cranidia from Branik, Bohemia.

The cranidium is similar to that of *Euarges parvulus* (Novak), the principal difference being that the median lobe is not parallel-sided, but expands rapidly forward, anterior to the bicomposite lateral lobes, so that it occupies the entire width of the glabella at the frontal margin.

Length of cranidium 2.5 mm.

Width of the cranidium 3.5 mm.

The plesiotype is Mus. Comp. Zoöl. no. 4474.

Subfamily DICRANOPELTINAE Phleger

Genus DICRANOPELTIS Hawle and Corda

DICRANOPELTIS FRAGOSA spec. nov.

Plate 1, fig. 2

The cranidium is almost semicircular, flattened, and covered with pustules of irregular size. The longitudinal furrows are very weakly incised between the third and fourth lateral glabellar furrows; the second lateral furrows are indicated by notches on the longitudinal furrows. The basal lobes are small, separated from the third lateral lobes by narrow furrows.

Cranidium 18mm. long, 18mm. wide at the palpebral lobes, and 24mm. wide at the base.

Dicranopeltis fragosa closely resembles *D. decipiens* (Winchell and Marcy) as figured by Weller,¹ but differs in showing the notch of the second lateral glabellar furrows on the longitudinal furrows, in having

¹Weller, Stuart, op. cit., pl. 22, figs. 10, 11.

the glabellar lobes less convex, and in having the longitudinal furrows less clearly incised between the third and fourth lateral furrows.

Formation and locality: Rochester shale, Lockport, New York.

The holotype is Mus. Comp. Zoöl. no. 1556.

Subfamily PLATYLICHADINAE Phleger

Genus AUTOLOXOLICHAS Phleger

AUTOLOXOLICHAS REEDI spec. nov.

Plate 1, fig. 1

The cranium is inflated, wider than long, with the anterior portion evenly rounded in plan. The completely circumscribed tricomposite lobes are elongate, oval, with a pit marking the position of the second lateral furrows, and with the third lateral glabellar furrows very deeply incised.

Measurements

Length of cranium	33 mm.
Greatest width of cranium	42 mm.
Width of lateral lobe	7 mm.
Width of median lobe at most narrow part	8 mm.

Autoloxolichas reedi differs from *A. st. mathiae* (Schmidt)¹, which it closely resembles, in the following respects: the cranium is more inflated, the third lateral furrows are very deeply incised and are not so close to the occipital furrow, and the lateral glabellar lobes do not expand anteriorly.

This is the oldest platylichad known; it definitely extends the Platylichadinae (Trochuridae) into the Lower Ordovician. For this reason it seems more likely that *Platylichas* is descended from *Autoloxolichas*, instead of *vice versa*, as the writer has previously suggested. It is also further evidence that Europe was the center of dispersal of the Lichadacea, since the three oldest genera of this superfamily are restricted to that continent.

Formation and locality: Etage D-di gamma, Vosek, Bohemia.

The holotype is Mus. Comp. Zoöl. no. 4475.

¹ Schmidt, Fr., op. cit., pp. 115-118, pl. 5, figs. 11-16.